

AMENDMENTS TO THE CLAIMS:

Please amend claims 1, 48-51, 61-66, 71-74, 76, and 77, cancel claims 12-47, 55, 67, and 84, and add claims 87-114 as follows:

1. (Amended) A steerable machine for breaking up ground comprising:

a frame;

at least one pair of rollable front supports and at least one pair of rollable rear supports, each of said front and rear supports including a chassis secured to the frame and said front supports being rotatable about a front vertical axis and at least one of the rear supports being [pivotalable] rotatable about a rear vertical axis;

said chassis includes a yoke that supports said rear support, and has a vertical pivot journal coupled to revolve on a support plate fixed to an end of a second actuator;

said second actuator comprises a second hydraulic jack set with a vertical axis, which has a second rod with a second rod end fixed to said plate and a second cylinder end, wherein said rod slides, integral with said frame;

the cylinder of said second hydraulic jack is an integral part of said frame being connected thereto by means of a first articulation for moving said chassis with respect to a fixed point on said frame in order to move the rear [rotatable] support inward of said frame;

at least one driver's cab located in said frame;

a means for breaking up the ground connected to said frame;

traction means supported by said frame for rotating at least one of said [rotatable] rollable supports;

at least one first actuator operatively coupled to the rear supports;
a maneuvering system accessible from said driver's cab for operating the actuator for rotating said rear supports about the rear vertical axis while turning the front supports of the machine.

Claims 12-47 (Canceled).

48. A machine for breaking up ground comprising:
a frame;
at least a first and second rollable front support;
at least a first and second rollable rear support, at least the first rear support being pivotable about a vertical axis between a retracted position and an extended position with respect to the frame;
at least one driver's cab located in said frame;
a ground breaking device coupled to the frame and configured to contact the ground;
a traction system coupled to the frame and configured to rotate at least one of said rollable supports; and
a steering system controllable from said driver's cab and configured to selectively steer the front supports and at least the first rear support at the same time, the steering system including
at least one rear hydraulic actuator configured to steer the first rear support,

at least one front hydraulic actuator configured to steer at least one of the first and second front supports, and
an electronic control unit configured to coordinate movement of the at least one rear and at least one front hydraulic actuators.

49. A machine according to claim 48, wherein the steering system further includes a first position detector operatively coupled to at least one of the first and second front supports, and a second position detector operatively coupled to at least the first rear support, the electronic control unit configured to electronically communicate with each of the first and second position detectors.

50. A machine according to claim 49, wherein the steering system further includes a third position detector configured to determine whether the first rear support is in the retracted position, the third position detector including a travel switch.

51. A machine according to claim 48, wherein the steering system further includes a plurality of position detectors, the electronic control unit configured to coordinate movement of the at least one rear and at least one front hydraulic actuators in response to signals received from the plurality of position detectors.

52. A machine according to claim 48, wherein the first rear support is steerable in both the extended and retracted positions.

53. A machine according to claim 48, wherein the first rear support is steerable according to a calculated geometry with respect to a common center of steering rotation of the front supports.

54. A machine according to claim 53, wherein the first rear support and front supports are maintained in a tangential orientation with respect to a turning radius extending from said common center of steering rotation to a respective vertical steering axis of each of said steered supports.

Claim 55 (Canceled).

56. A machine according to claim 48, further comprising a chassis coupled to the first rear support, and a linkage assembly connected to said chassis and configured to move said chassis between the extended and retracted positions.

57. A machine according to claim 48, further comprising a chassis coupled to the first rear support, the chassis including a support plate coupled to a second actuator, the second actuator configured to move the chassis in a vertical direction.

58. A machine according to claim 48, further comprising a chassis coupled to the first rear support, the chassis including a support plate and a yoke member, the yoke member being rotatable relative to said support plate.

59. A machine according to claim 58, wherein the first actuator is coupled between the support plate and the yoke member to steer the first rear support.

60. A machine according to claim 59, further including a second actuator coupled between the frame and the first rear support, and the yoke member including a vertical rotation axis offset from a vertical axis of the second actuator.

61. A machine according to claim 48, further including:

- a first valve configured to supply hydraulic fluid to the front actuator;
- a second valve controlled by said steering system and configured to supply hydraulic fluid to the rear actuator;
- a first position detector cooperating with said front actuator;
- a second position detector cooperating with said rear actuator;
- the electronic control unit cooperating with the steering system and configured to operate said rear actuator in response to the steering of the first and second front supports; and
- the electronic control unit electrically coupled to said first and second position detectors, to a third position detector configured to determine whether the first rear support is in the retracted position, and to the first and second valves.

62. A method of operating a machine having first and second rollable front supports, and first and second rollable rear supports, comprising:

controllably pivoting the first rear support between a retracted position and an extended position with respect to a frame of the machine;

controllably contacting a ground breaking device of the machine with the ground;

rotating at least one of the first and second front and rear supports;

steering the first and second front supports;

steering the first rear support in a coordinated manner with the first and second front supports, the pivoting of the first rear support and steering of the first and second front supports and first rear support including actuating a plurality of actuators;
and

controlling at least the pivoting of the first rear support and steering of the first and second front supports and first rear support by an operator positioned in an operator cab.

63. A method according to claim 62, further including providing hydraulic fluid to a first actuator of the plurality of actuators to steer the first rear support.

64. A method according to claim 63, further including controlling the hydraulic fluid provided to the first actuator by an electronic control unit receiving signals from at least a first position detector cooperating with the first actuator, a second position detector cooperating with a second actuator of the plurality of actuators, and a third position detector configured to determine whether the first rear support is in the retracted position.

65. A method according to claim 63, further including providing hydraulic fluid to a second actuator of the plurality of actuators.

66. A method according to claim 65, further including providing hydraulic fluid to a third actuator of the plurality of actuators to move the first rear support in a vertical direction.

Claim 67 (Canceled).

68. A method according to claim 62, further including steering the first rear support in both the extended and retracted positions.

69. A method according to claim 62, further including determining whether the first rear support is in the retracted position.

70. A method according to claim 69, further including controlling the steering of the first rear support based at least on whether the first rear support is in the retracted or extended position.

71. A steerable machine for breaking up ground comprising:
a frame;

at least one pair of rollable front supports and at least one pair of rollable rear supports, each of said front and rear supports including a chassis secured to the frame and said each of the front supports being rotatable about a front vertical axis and at least one of the rear supports being pivotable about a first rear vertical axis;

said chassis includes a yoke that supports said rear support, and has a vertical pivot journal coupled to revolve on a support plate fixed to an end of a second actuator;

said second actuator comprises a second hydraulic jack set with a vertical axis, which has a second rod with a second rod end fixed to said plate and a second cylinder end, wherein said rod slides, integral with said frame;

the cylinder of said second hydraulic jack is an integral part of said frame being connected thereto by means of a first articulation for moving said chassis with respect to a fixed point on said frame in order to move the rear support inward of said frame;

at least one driver's cab located in said frame;

a means for breaking up the ground connected to said frame;

traction means supported by said frame for rotating at least one of said rollable supports;

at least one first actuator operatively coupled to at least one rear support;

a steering system accessible from said driver's cab for operating the first actuator for rotating at least one of said rear supports about a second rear vertical axis while turning the front supports of the machine.

72. A machine according to claim 71, wherein the steering system further includes a third hydraulic actuator configured to steer at least one of the front supports, and an electronic control unit configured to coordinate movement of the at least the first and second hydraulic actuators.

73. A machine according to claim 71, wherein the steering system further includes a first position detector operatively coupled to at least one of the front supports, a second position detector operatively coupled to at least one of the rear supports, and an electronic control unit configured to electronically communicate with each of the first and second position detectors.

74. A machine according to claim 73, wherein the steering system further includes a third position detector configured to determine whether the pivotable rear support is in the retracted position, the third position detector including a travel switch.

75. A machine according to claim 71, wherein the pivotable rear support is steerable in both the extended and retracted positions.

76. A machine according to claim 71, wherein the steering system is configured to selectively steer the pair of rear supports.

77. A steerable machine for breaking up ground comprising:
a frame;

at least one pair of rollable front supports, said front supports being rotatable about a front vertical axis and front steering means controlled by power steering for steering said front supports;

at least one pair of rollable rear supports, at least one of said rear supports being pivotable about a rear vertical axis and rear steering means controlled by at least one steering hydraulic cylinder for steering said pivotable rear support;

at least one driver's cab located in said frame;

a means for breaking up the ground connected to said frame;

traction means supported by said frame for rotating at least one of said rollable supports;

a steering system accessible from said driver's cab for operating said front steering means and said rear steering means at the same time, from said driver's cab, the steering system including a manual steering input device.

78. A machine according to claim 77, wherein the front steering means includes at least one front steering hydraulic cylinder configured to steer at least one of the front supports, and the machine further including an electronic control unit configured to coordinate movement of the rear steering hydraulic cylinder and front steering hydraulic cylinder.

79. A machine according to claim 77, wherein the maneuvering system further includes a first position detector operatively coupled to at least one of the front supports, a second position detector operatively coupled to at least the pivotable rear support,

and an electronic control unit configured to electronically communicate with each of the first and second position detectors.

80. A machine according to claim 79, wherein the maneuvering system further includes a third position detector configured to determine whether the pivotable rear support is in the retracted position, the third position detector including a microswitch.

81. A machine according to claim 77, wherein the pivotable rear support is steerable in both the extended and retracted positions.

82. A machine according to claim 77, wherein the pivotable rear support is steerable according to a calculated geometry with respect to a common center of steering rotation of the front supports.

83. A machine according to claim 82, wherein the pivotable rear support and front supports are maintained in a tangential orientation with respect to a turning radius extending from said common center of steering rotation to a respective vertical steering axis of each of said steered supports.

Claim 84 (Canceled).

85. A machine according to claim 77, further comprising a chasis coupled to the pivotable rear support, the chassis including a support plate and a yoke member, the yoke member being rotatable relative to said support plate.

86. A machine according to claim 85, wherein the steering hydraulic cylinder is coupled between the support plate and the yoke member to steer the pivotable rear support.

87. A machine according to claim 1, the actuator is movable in response to said maneuvering system and to a position signal indicating that said at least one rear supports is located inward of the frame.

88. A machine according to claim 48, wherein the first rear support is located inside the frame when in the retracted position.

89. A machine according to claim 48, wherein the first rear support includes a fixed member and a yoke member, the yoke member being rotatable relative to the fixed member.

90. A machine according to claim 89, wherein the fixed member is fixed to a rod end of a vertical hydraulic actuator and the rear hydraulic actuator is coupled between the fixed member and the yoke member to steer the first rear support.

91. A machine according to claim 48, wherein the first rear support is steerable about a vertical steering axis in response to said steering system and to a position signal indicating that the first rear support is in the retracted position.

92. A machine according to claim 91, wherein a position detector provides the position signal, the position detector including a microswitch.

93. A machine according to claim 91, wherein the first rear support is steerable according to a calculated geometry with respect to a common center of steering rotation of the front supports.

94. A machine according to claim 91, further including a chassis supporting the first rear support and a first articulation connected to said chassis and adapted to move said chassis between the extended and retracted positions of the first rear support.

95. A machine according to claim 94, wherein said chassis includes a support plate being connected to a second rear actuator adapted to move said chassis in a vertical direction along a vertical axis, said second rear actuator being connected to said frame via said first articulation.

96. A machine according to claim 95, wherein said second rear actuator includes a hydraulic actuator having a cylinder connected to said frame by means of said first articulation.

97. A machine according to claim 94, further including respective chasses of the front supports which are interlinked by means of a second articulation, at least one of said chasses cooperating with a third actuator adapted to rotate said chassis around a vertical axis.

98. A machine according to claim 59, wherein the first rear support includes a support column and the yoke member includes a vertical rotation axis offset from a vertical axis of the support column.

99. A machine according to claim 62, wherein the first rear support is located inside the frame when in the retracted position.

100. A machine according to claim 64, wherein the third position detector includes a travel switch.

101. A machine according to claim 77, wherein the pivotable rear support includes a fixed member and a yoke member, the yoke member being rotatable relative to the fixed member.

102. A machine according to claim 101, wherein the fixed member is fixed to a rod end of a vertical hydraulic actuator and the rear steering hydraulic cylinder is coupled between the fixed member and the yoke member to steer the pivotable rear support.

103. A machine for breaking up ground comprising:

- a frame;
- at least a first and second rollable front support;
- at least a first and second rollable rear support, at least the first rear support being pivotable about a vertical axis between a retracted position and an extended position with respect to the frame;
- at least one driver's cab located in said frame;
- a ground breaking device coupled to the frame and configured to contact the ground;
- a traction system coupled to the frame and configured to rotate at least one of said rollable supports; and
- a steering system controllable from said driver's cab and configured to selectively steer the front supports and at least the first rear support at the same time, the steering system including
 - at least one rear hydraulic actuator configured to steer the first rear support,
 - at least one front hydraulic actuator configured to steer at least one of the first and second front supports, and

a control circuit configured to coordinate movement of the at least one rear and at least one front hydraulic actuators.

104. A machine according to claim 103, wherein the control circuit includes a pressurized oil distribution circuit.

105. A machine according to claim 104, wherein the control circuit further includes an electronic control unit and a plurality of position detectors connected to the electronic control unit for sensing a position of at least one of the first and second front supports, and the first rear support.

106. A machine according to claim 103, wherein the control circuit includes a position detector configured to determine whether the first rear support is in the retracted position.

107. A steerable machine for breaking up ground comprising:
a frame;
at least one rollable front support, said front support being rotatable about a front vertical axis and a front steering assembly controlled by power steering having at least one steering hydraulic cylinder for steering said front support;
at least one pair of rollable rear supports, at least one of said rear supports being pivotable about a rear vertical axis and a rear steering assembly having at least one steering hydraulic cylinder for steering said pivotable rear support;

at least one driver's cab located in said frame;
a means for breaking up the ground connected to said frame;
traction assembly supported by said frame for rotating at least one of said
rollable supports; and
a steering system accessible from said driver's cab for operating said front
steering assembly and said rear steering assembly at the same time, from said driver's
cab.

108. A machine according to claim 107, wherein the pivotable rear support is
steerable about a vertical steering axis in response to said steering system and to a
position signal indicating a pivoting position of the pivotable rear support.

109. A machine according to claim 108, wherein a position detector provides
the position signal, the position detector including a microswitch.

110. A machine according to claim 108, wherein the pivotable rear support is
steerable according to a calculated geometry with respect to a common center of
steering rotation of the at least one front support.

111. A machine according to claim 108, further including a chassis supporting
the pivotable rear support and a first articulation connected to said chassis and adapted
to pivot said chassis between an extended position and a retracted position.

112. A machine according to claim 111, wherein said chassis includes a support plate being connected to an actuator adapted to move said chassis in a vertical direction along a vertical axis, said actuator being connected to said frame via said first articulation.

113. A machine according to claim 112, wherein said actuator includes a hydraulic actuator having a cylinder connected to said frame by means of said first articulation.

114. A machine according to claim 111, further including a chassis of the front support that is interlinked by means of a second articulation, said front chassis cooperating with the at least one front steering hydraulic cylinder to rotate said chassis around a vertical axis.